## Two More Moon Tracking Computer Programs



varian, EIMAC division 301 industrial way san carlos, california 94070 The first moon tracking computer program included here was rewritten from WAIJXN/WA3GPL and K5JL versions presented in earlier issues of the EME notes. Warren Butler, W2WD, wrote the program for TRS-80 level II BASIC(16K). Cassette copies of the program are available from Warren for the cost of the cassette and postage (approximately \$1.00).

The second program was written in FORTRAN IV by Geoffrey Grayer, G3NAQ. Again the WA1JXN/WA3GPL program served as the starting point for this effort.

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1ø °
                  COORDINATES OF THE MOON
20 PRINT
30 ' DISLAYS GHA, DECLINATION, AZIMUTH, ELEVATION OF THE MOON
40 FROM A SELECTED LATITUDE, LONGITUDE FOR SELECTED DATES
50 ' AND TIMES (GMT). EASTERN STANDARD TIME IS SHOWN BUT CAN BE CHANGED --
60 ° @ LINE 2040, CHANGE 500 TO TIME DIFFERENTIAL DESIRED--
70 ' EG., FOR PACIFIC STANDARD TIME, USE 800 IN PLACE OF 500.
80 ' @ LINES 850 & 860 CHANGE EST TO TIME ZONE DESIRED --
gg ' eg.. REPLACE EST WITH PST FOR THE EXAMPLE BEING USED.
100 ' HARDCOPY OUTPUT CAN BE SELECTED IF PRINTER IS AVAILABLE;
110 ' OTHERWISE, DATA WILL BE DISPLAYED ON CRT ONLY.
12# PRINT
130 ' BASED ON PROGRAMS BY LANCE COLLISTER, WAIJXN/WA3GPL AND
14# ' JAY LIEBMANN, K5JL.
150 MODIFIED FOR TRS-80 LEVEL II BASIC (16K) BY WARREN BUTLER, W2WD
                                                                 (4/4/79).
160 PRINT
170 ' DATA FOR UP TO 31 DAYS CAN BE REQUESTED---EACH TIME THE
18∥ ' COMPUTER ASKS FOR AN INPUT BY PRINTING ?, ENTER DATA IN
190 ' THE FORMAT REQUESTED. AFTER THE LAST INPUT, INSERT ZEROS
200 ' IN THE SAME FORMAT.
210 ANSWER OTHER QUESTIONS AS APPROPRIATE
220 UNIVERSAL WINDOWS ARE SHOWN BY LETTERS FOLLOWING DEC VALUES
238 " U = EUROPEAN UNIVERSAL WINDOW
248 " W = W/VE UNIVERSAL WINDOW
250 ' J = J/VK/ZL UNIVERSAL WINDOW
26g CLEAR 5gg
27ø DIM F(31),V(31),Y(31),Q(31),S(31)
28ø P5=2.ØØØØØØØØØØ*3.1415926535
29Ø D5=36Ø.ØJJØJØJØJØJ/P5
3VØ R5=P5/360.03333933306
310 CLS:PRINT:PRINT:PRINT:PRINT"WHAT ARE THE STATION CALL LETTERS";
32Ø INPUT W$
33Ø PRINT"WHAT IS YOUR LATITUDE IN DEGREES, MINUTES";
34Ø INPUT L5,U5
350 PRINT"WHAT IS YOUR LONGITUDE IN DEGREES, MINUTES";
36ø INPUT L6,U6
37Ø
    L5=(L5+U5/6Ø)*R5
38₺
     L6=(L6+U6/6Ø)*R5
39# PRINT"WHAT IS THE DESIRED PRINTING INCREMENT IN MINUTES";
410 INPUT"DO YOU ONLY WANT PRINTOUT WHEN THE MOON IS NEAR THE HORIZON
                                                                      (YES/
      0)";B$
43Ø IF B$="YES" THEN 46Ø
448 LET 16=188
45Ø GOTO 55Ø
46Ø INPUT"BELOW WHAT ELEVATION IN DEGREES DO YOU WANT PRINTOUT"; 16
470 INPUT"DO YOU WANT HARDCOPY PRINTOUT (YES/NO)"; WW$
480 PRINT"WHAT ARE THE GMT MONTH, DAY, YEAR DESIRED?"
490 PRINT"USE FORMAT MM, DD, YYYY ---- 4-DIGITS FOR YEAR"
500 FOR N=1 TO 31
```

```
510 INPUT F(N), V(N), Y(N)
520 IF F(N)=0 THEN 640
53Ø NEXT N
54Ø GOTO 5ØØ
55$ INPUT"DO YOU WANT HARDCOPY (YES/NO)"; WW$
560 PRINT
57 PRINT"WHAT ARE THE GMT MONTH, DAY, YEAR, TIME BEGINNING, TIME ENDING?"
580 PRINT"USE THE FORMAT MM, DD, YYYY, TTTT, TTTT
REMINDER --- USE 4 DIGITS FOR YEAR!"
59$ FOR N=1T031
600 INPUT F(N), V(N), Y(N), Q(N), S(N)
610 IF F(N)=0 THEN 640
628 NEXT N
639 GUTO 598
640
    N5=N-1
650 FOR N=1 TO N5
66$ IF B$="YES" THEN 68$
678 GUTO 718
680
    E1=2400
698 B=Ø
700 GOTO 730
71Ø
    E1=S(N)
720
     B=Q(N)
73Ø
     M=F(N)
74Ø
     D=V(N)
75Ø
     Y=Y(N)
76Ø
    Y1=Y-(INT(Y/133) = 133)
77Ø PRINT
78 IF WW$="YES" LPRINT
79Ø PRINT:CLS
800 IF WW$="YES" LPRINT
81¢ PRINT"POSITION OF THE MOON ON ";M;"/";D;"/";Y1;" GMT FROM"" "W$
82# IF WW$="YES" LPRINT"POSITION OF THE MOON ON ";M;"/";D;"/";Y1;" GMT FROM"" "W
      $
830 PRINT
840 IF WW$="YES" LPRINT
85# PRINT"GMT"TAB(11)"GHA"TAB(21)"DEC"TAB(35)"EST"TAB(47)"AZ"TAB(57)"EL"
86Ø IF WW$="YES" LPRINT"GMT"TAB(11)"GHA"TAB(21)"DEC"TAB(35)"EST"TAB$47)"AZ"TAB(5
      7)"EL"
870 PRINT
88Ø IF WW$="YES" LPRINT
89Ø I1=2
9$$ IF M>=3 THEN 98$
91Ø IF INT((Y-1853)/4)≤11 THEN 94Ø
920
    C1 = -1
93Ø GOTO 95Ø
940 C1=0
95Ø
    J1=365\%(Y-1853)+D+35\%(M+9)+INT((M+15)/2)
96\emptyset J2=INT((Y-1853)/4)+1+C1
97Ø GOTO 1Ø9Ø
98$ IF INT((Y-1852)/4)<11 THEN 1$1$
99ø C1=-1
1000 GOTO 1025
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1010 C1=0
1020 IF M=9 THEN 1060
1030 IF M=11 THEN 1960
1848 C2=8
1Ø5Ø GOTO 1Ø7Ø
1868
     C2=1
1 \% 7 \% \ J1 = 365 \% (Y - 1852) + D + 3 \% \% (M - 3) + INT ((M - 2)/2)
188B
     J2=INT((Y-1852)/4)+C1+C2
1898 J=J1+J2
1100 TI=J-17472.5
1110 D9=(B-INT(B/190)"100)+INT(B/100)"60
112Ø D6=(E1-INT(E1/1ØØ)*1ØØ)+INT(E1/1ØØ)*6Ø
1138 D7=D9-D6
114Ø D8=D7-I
1150 IF D7>0 THEN 1175
116ø GOTO 119ø
1170 IF D8>=0 THEN 2150
118Ø B=E1
119Ø T=(B-INT(B/13Ø) #1ØØ)/144Ø+INT(B/1ØØ)/24
12 MØ T5=T1+T
1210 K1=((.751213+.036601102"T5)-INT(.751213+.036601102"T5))"P5
1220 K2=((.822513+.0362916457"T5)-INT(.822513+.0362916457"T5))"P5
123Ø K3=((.995766+.$$273777852"T5)-INT(.995766+.$$273777852"T5)) P5
1240 K4=((.974271+.0338631922*T5)-INT(.974271+.0338631922*T5))*P5
1250 K5=((.$312525+.$367481957*T5)-INT(.$312525+.$367481957*T5))*P5
1260 L8=K1+.658"R5"SIN(2"K4)+6.289"R5"SIN(K2)
127$ L8=L8-1.274*R5*SIN(K2-2*K4)-.186*R5*SIN(K3)
1280 L8=L8+.214"R5"SIN(2"K2)-.114"R5"SIN(2"K5)
129$ L8=L8-.$59*R5*SIN(2*K2-2*K4)-.$57*R5*SIN(K2+K3-2*K4)
13$$ K6=K5+.6593*R5*SIN(2*K4)+6.23$3*R5*SIN(K2)-1.272*R5*SIN(K2-2*K4)
1310 L7=5.144"R5"SIN(K6)-.146"R5"SIN(K5-2"K4)
1320 LET D1=COS(L7) "SIN(L8)".397821+SIN(L7)".917463
1330 LET D1=ATN(D1/(SQR(1-D1±2)))
134# G1=5#+.5+((D1)/(.792))#D5
135Ø G2=8$+((D1)/(.8$8))*D5
136Ø G3=141.5-((D1)*(.738)*D5)
137# G4=17#.5-((D1)*(.857)*D5)
138# A2=COS(L7) COS(L8)/COS(D1)
139# A1=(COS(L7)#SIN(L8)#.917463-SIN(L7)#.397821)/COS(D1)
1488 A=ATN(A1/A2)
141Ø GOSUB 167Ø
1428 R1=A
1430 L1=.$657$9822#T1
1440 L=T*24*1.002738+6.646055+(L1-INT(L1/24)*24)
1450 L=(L-INT(L/24) 24)
146ø G=(L/24)*P5-R1
1470 IF G&P5 THEN 1500
148Ø G=G-P5
149Ø GOTO 153Ø
1500 IF G<0 THEN 1520
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151Ø GOTO 153J
1529 G=G+P5
1538 H=L6-G
154$ E3=COS(L5)*COS(H)*COS(D1)+SIN(D1)*SIN(L5)
1550 E2 = SOR(1 - (E3 \times E3))
156 \beta E=ATN((E3/E2)-(1/(61.33*E2)))
157 F = ATN(E3/E2)
158$ IF E<$ THEN 21$$
159Ø IF E>16"R5 THEN 21ØØ
16 $ A2 = SIN(D1)/(COS(L5) "COS(F))
161# A2=A2-(SIN(L5)/COS(L5))*(SIN(F)/COS(F))
1620 A1=SIN(L5)"SIN(D1)+COS(L5)"COS(D1)"COS(H)
163Ø A1=(SIN(H)*COS(D1))/SQR(1-A1±2)
1648 A=ATN(A1/A2)
165Ø GOSUB 167Ø
166ø GOTO 182ø
1670 IF A=0 THEN 1690
168Ø GOTO 173Ø
169Ø IF A2<Ø THEN 171Ø
1700 GOTO 1810
171Ø A=P5/2
172Ø GOTO 181Ø
173Ø IF A>Ø THEN 179Ø
1740 IF A2<0 THEN 1770
175Ø A=P5+A
176 GOTO 1813
177Ø A=P5+(A-P5/2)
178Ø GOTO 181J
179# IF A2=> # THEN 181#
1800 A=A+P5/2
1810 RETURN
182Ø JF (T-I1)>(2"I)/144Ø THEN 184Ø
1830 GOTO 1850
1840 PRINT
185岁 BS=INT(B+.5):BS$="####"
186Ø Z1=INT(A*D5*1Ø+.5)/1Ø
187Ø Z2=INT(E*D5*1Ø+.5)/1Ø
188Ø Z3=INT(G"D5"19+.5)/1Ø
189Ø Z4=INT(D1"D5"10+.5)/10
19ØØ IF Z4<Ø THEN 253Ø
191Ø IF Z3<G1 THEN 2ฮี3ฮี
192Ø IF Z3>G2 THEN 194₺
193Ø GOTO 197Ø
194Ø IF Z36G3 THEN 199Ø
195Ø IF Z3>G4 THEN 2Ø3Ø
196Ø GOTO 201Ø
197Ø Y$="U"
198Ø GOTO 254Ø
1990 Y$="W"
2月月月 GOTO 2月4月
```

```
2818 Y$="J"
2Ø2Ø GOTU 2Ø4Ø
2$3$ Y$=" "
2848 ES=(INT(B+.5))-588
2$5$ IFES = STHENES = ES+24$$
2月6月 ES$="####"
2Ø7Ø PRINTUSINGBS$;BS;:PRINTTAB(1Ø)Z3TAB(2Ø)Z4;Y$TAB(35)USINGES$;ES;:PRINTTAB¢45
      )Z1TAB(55)Z2
2$8$ IF WW$="YES" LPRINTUSINGBS$;BS;:LPRINTTAB(1$)Z3TAB(2$)Z4;Y$TAB¢35)USINGES$;
     ES;:LPRINTTAB(45)Z1TAB(55)Z2
2090 I1=T
21 Ø B = B + I
2119 Z=(B-INT(B/IØJ)^{2}19Ø)-6Ø
212$ IF Z<$ THEN 111$
2130 B=INT(B/1d0)#190+190+Z
2 Ø GOTO 1115
215Ø NEXT N
216 N N= Ø
2170 PRINT
218Ø PRINT
219) PRINT"DO YOU WANT MORE INFORMATION (YES/NO)";
22 FØ INPUT D$
221Ø IF D$="YES" THEN 28Ø
SSSA END
```

## POSITION OF THE MOON ON 5 / 19 / 79 GMT FROM W2WD

GMT	GHA	DEC	EDT	AZ	EL
×615	357.4	-1ø	<b>*215</b>	1ø6	2.2
<b>×63</b> Ø	1	-9.9	*23ø	188.4	4.9
×645	4.6	-9.9	×245	11ø.8	7.5
×7ØØ	8.2	-9.8	#3ØØ	113.4	1ø.1
<b>*715</b>	11.8	-9.8	×315	115.9	12.6
#73Ø	15.4	-9.8	#33Ø	118.6	15.1
×745	19.1	-9.7	<b>*345</b>	121.3	17.5
#80A	22.7	-9.7	<b>អ</b> 4្វត្ត	124.2	19.8
*815	26.3	-9.6	×415	127.2	22.1
×83ø	29.9	-9.6	*43ø	139.3	24.3
×845	33.5	-9.6	×445	133.5	26.4
*9øø	37.1	-9.5	*5øø	136.9	28.4
×915	4ø.8	-9.5	×515	140.4	3Ø.3
×93Ø	44.4	-9.4	×53Ø	144.1	32
×945	48	-9.4	*545	147.9	33.6
1 ผ ต ผ	51.6	-9.4	×6øø	151.9	35
1Ø15	55.2	-9.3	*615	156.1	
1434	58.8	-9.3	*63ø		36.2
1Ø45	62.5	-9.2	*645	16ø.4	37.3
		-9.2		164.8	38.2
1100	66.1	-9.2	*7 Ø Ø	169.3	38.8
1115	69.7	-9.1	¥715	174	39.3
113Ø	73.3	-9.1	#73Ø	178.6	39.5
1145	76.9	-9.1	*745	183.3	39.5
1200	8ø.5	-9	#8øø	188	39.3
1215	84.2	-9	<b>*815</b>	192.6	38.8
123ø	87.8	-8.9	*83ø	197.1	38.2
1245	91.4	-8.9	×845	201.5	37.3
1300	95	-8.9	*9øø	205.8	36.2
1315	98.6	-8.8	<b>*915</b>	21Ø	35
1330	102.2	-8.8	×93ø	214	33.5
1345	105.9	-8.7	<b>*945</b>	217.9	31.9
1488	109.5	-8.7	1øgg	221.5	3Ø.2
1415	113.1	-8.6	1015	225.1	28.3
143Ø	116.7	-8.6	1030	228.5	26.4
1445	120.3	-8.6	1045	231.7	24.3
15 B B	123.9	-8.5	1199	234.8	22.1
1515	127.6	-8.5	1115	237.8	19.8
153Ø	131.2	-8.4	113ø	24Ø.7	17.5
1545	134.8	-8.4	1145	243.5	15.1
16øø	138.4	-8.4	12 Ø Ø	246.2	12.6
1615	142	-8.3	1215	248.8	10.1
163ø	145.6	-8.3	1230	251.4	7.6
1645	149.3	-8.2	1245	253.9	4.9
1700	152.9	-8.2	1300	256.3	2.3
10 The state of th	Alternative - Apparent and Sale				_ , ,

0023

0037

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THIS PROGRAM IS DESIGNED TO CALCULATE THE AZIMUTH AND ELEVATION OF THE MOON
       THIS IS A FURTRAN VERSION OF PROGRAM 3 OF THE EIMAC EME NOTE AS-49-6 ORIGINALLY WRITTEN BY LANCE CULLISTER WA3GPL, CONVERTED BY GEOFF GRAYER G3NAQ.
       THE INPUT FORMAT IS AS FOLLOWS ...
       FIRST DATA CARD: OF STATION (A1U), LAT. OF STATION DEGS.(110), LAT. OF STATION MINS. (11U), LONG. OF STATION DEGS. (11U), LONG. OF STATION MINS. (11U).
       SECOND AND SUBSEQUENT DATA CARDS:
YEAR (11U), MONTH (110), DAY (11U), START HRS.MINS.(110), STOP HRS.MINS.(110)
TIME INCREMENT MINS.(110) - DEFAULT 10 MINS., MAXIMUM ELEVATION DEGS. (110) -
MAY BE USED TO SELECT PRINTOUT ONLY WHEN THE MOON IS NEAR THE HORIZON -
        MAY BE USED TO S
DEFAULT 90 DEGS.
       ALL TIMES ARE IN GMT USING THE UJUU TO 2400 HOUR SYSTEM.
       A BLANK CARD DENOTES THE END OF THE DATA SET AND TERMINATES THE PROGRAM.
C PRINTOUT IS SUSPENDED WHENEVER THE ELEVATION OF THE MOON IS NEGATIVE.
C FOR FURTHER INFORMATION, REFER TO THE EIMAC NOTE.
                                                                                                                                                                                                                                     GEOFFREY H. GRAYER G3NA
BRIGHTWALTON, BERKSHIRE
APRIL, 1978
                                                                                                                                                                                                                                                                                        GRAYER G3NAQ
ÄPRIL, 1978 ... APRIL, 1978 ... Second control of the control of t
               REAL L5,L6,I1

REAL L5,L6,I1

REAL L5,L6,I1

REAL K4 JD

DIMENSION IDENT(10),GMT(4)

FNA(X)=AINT(X*05*10*+U*5)/1U*

FNB(X)=(X-AINT(X))*P5

PI=3**.415926535

P5=2**.8P1

D5=180./PI

READ STATION IDENT, LAT DEGS, LAT MINS, LONG DEGS, LONG MINS

READ (5,1) IDENT,LATD,LATM,LUNGD,LUNGM

1 FORMAT (1041-4110)

L5=(LATD+LATM/60**)*R5

L6=(LONGD+LONGM/60**)*R5

10 CONTINUE

READ YEAR,MONTH,DAY,(START | IME GMI),(END TIME GMT),(TIME INCREMENT MINS),

(MAXIMUM ELEVATION DEGS)

READ (5,2) Y,M,D,H,E1,I,16

2 FORMAT(7110)

IF(1**,E2**-U) STOP

IF(1**,E2**-U) STOP

IF(1**,E2**-U) E1=2400

CALCULATE JULIAN DATE

[F (M. CE**-E1**-U) E1=2400

CALCULATE JULIAN DATE
               C READ
              C CALCULATE JULIAN DATE
IF (M.GE.3) GO TO 16
C1=-1
                         C1==1

IF(((Y=1853)/4)_LT_11) C1=U

J1=365*(Y=1853) + 3U*(M+9) + ((M+1U)/2) + D

J2=((Y=1855)/4) + C1 + 1

GO TO 2?

16 C1==1

IF (((Y=1852)/4)_LT_11) C1=U

IF (M_EQ_9_UR_M_EQ_11) GU TO 24

22 C2=U

GO TO 25
                           GO TO 25

24 C2=1

25 J1=365*(Y=1852) + 3U*(M=3) + ((M=2)/2) + D

J2= ((Y=1852)/4) + C1 + C2

27 J=J1+J2
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```
FORTRAN IV G1 RELEASE 2.0
                                                                                                                                                                                        MAIN
                                                                              T1=FLOAT(J)=17472.5

JD=FLOAT(J)+2397547.5

WRITE (6,3) IDENT, LATD, LATM, LONGD, LONGM, Y, M, D, JD

3 FORMAT ('1LUNAR COORDINATES FOR '.10A1/' STATION LAT: '.214,'
+LONG: '.214/' DATE '.14,'/',12,'/',12,' JD=',F12.1//)
WRITE(6,5)

5 FORMAT(' GMT AZ EL GHA DEC

29 D9=B - (B/100)*100 + (B/100)*60
D6=E1 - (E1/100)*100 + (E1/100)*60
D7=D9-D6
D8=D7-I
IF(D7.LE.0) GO TO 38
IF(D8.GE.U) GO TO 10
B=E1

C CALCULATE LUNAR LAT AND LONG
38 T=FLOAT(B-(B/100)*100)/1440.+FLOAT(B/100)/24.

T5=I1+T
                                                                                                                                                                                                                                                                                                                                                                                                  DEC'/)
                                                                              T=FLOAT(B=(B/10U)*10U)*10U)/144U_+FLOAT(B/10U)/24.

T5=T1+T

K1=FNB(U_*751213+U_*U366U11U2*T5)

K2=FNB(U_*822513+U_*U362916457*T5)

K3=FNB(U_*995766+U_*0U273777852*T5)

K4=FNB(U_*995766+U_*U0338631922*T5)

K5=FNB(U_*974271+U_*U338631922*T5)

K5=FNB(U_*U312525+U_*U367481957*T5)

L8=K1+U_*658*R5*SIN(2_*K4)+6_*289*R5*SIN(K2)

L8=L8-1_*274*R5*SIN(K2-2_*K4)+U_*186*R5*SIN(K3)

L8=L8+U_*214*R5*SIN(2_*K4)+U_*186*R5*SIN(K2-K3-2_*K4)

K6=K5+_6593*R5*SIN(2_*K2)-U_*114*R5*SIN(K2-K3-2_*K4)

K6=K5+_6593*R5*SIN(2_*K2+2_*K4)+U_*057*R5*SIN(K2-K3-2_*K4)

L7=5_*144*R5*SIN(K6)-U_*146*R5*SIN(K5-2_*K4)

C CALCULATION OF RA AND DEC

D1=COS(L7)*SIN(L8)*U_*397821+SIN(L7)*U_*917463

D1=ATAN2(D1,*SQRT(1_*=D1**2))

A2=COS(L7)*SIN(L8)*U_*917463-SIN(L7)*U_*397821)/COS(D1)

A=ATAN2(A1,*A2)

R1=A
                                                                               A=ATAN2(A1,A2)
R1=A
L1=0.065709822*11
L=T*24.*1.002738+6.646055+(L1=AINT(L1/24)*24.)
L=(L=AINT(L/24)*24)

C CALCULATION OF GREENWICH HOUR ANGLE G FROM LOCAL SIDERIAL TIME
G=(L/24)*P5=R1
IF(G.LT.P5) GO TO 67
G=G=P5
GO TO 71
67 IF(G.LT.U.) GO TO 69
GO TO 71
69 G=G+P5
C CALCULATION OF LOCAL HOUR ANGLE H FROM GHA
     0075
0076
0077
      0080
                                                                                C CALCULATION OF LOCAL HOUR ANGLE H FROM GHA
                                                                              0081
     2800
    0084
      0086
                                                                                        AZ=FNA(A)

EL=FNA(E)

GHA=FNA(G)

DEC=FNA(D1)

GMT(1)=B/1UUU

GMT(2)=B/1UU-(B/1UUU)*1U

GMT(3)=B/1UU-(B/1UU)*1U

GMT(4)=B-(B/1U)*1U

IF((T-I1)_GT_(2.*I/144U_)) WRITE (6,7)

7 FORMAT(1H)

104 WRITE(6,6) GMT,AZ,EL,GHA,DEC

6 FORMAT(3H,4F12.1)

11=T
                                                                                         117 B=B+I
```

```
DATE = 78111
                                                                                                                       17/56/51
                                                                                                                                             PAGE 0003
FORTRAN IV G1 RELEASE 2.0
                                                           MAIN
                                   Z=B-(B/100)*100 - 60
IF(Z_LT_0) 60 TO 29
B=(B/100)*100 + 100 + Z
G0 TO 29
```

LUNAR COURDINATES FOR G3NAQ STATION LAT: 51 34 LONG: 1 18 DATE 1978/ 5/2U JD= 2443648\_0

GMT	AZ.	EL	GHA	DEC
0000 0010 0020 0030 0040 0150 0110 0120 0130 01450 02210 02230 02230 02230 0230 02310	-143.7 -143.9 -143.9 -134.1 -134.1 -132.9 -132.7 -125.4 -125.4 -117.4 -117.4 -1111.5 -1107.8 -105.9	33433108630740628394 4321098630740628394	26058371404715048260 46918371404715048260 533444485555666677778	77778888899990UUU111122
1117340 0000 1117750 11177881 11188450 11199340 111111111111111111111111111111111111	21009999901246814704937394073852158260483 10113114080257913580257913558025702570258963186308 111111111111111111111111111111111111	158259147912455555420851727147901008630515 012456890134567890122344556666777766665	04716148260493715938269481515827048371593 5792449448888893715938889399990000116813580353334445570246914681 28889999000001168132223333333333333333333333333333333	5556666/7778888999990001111111111111111111111111